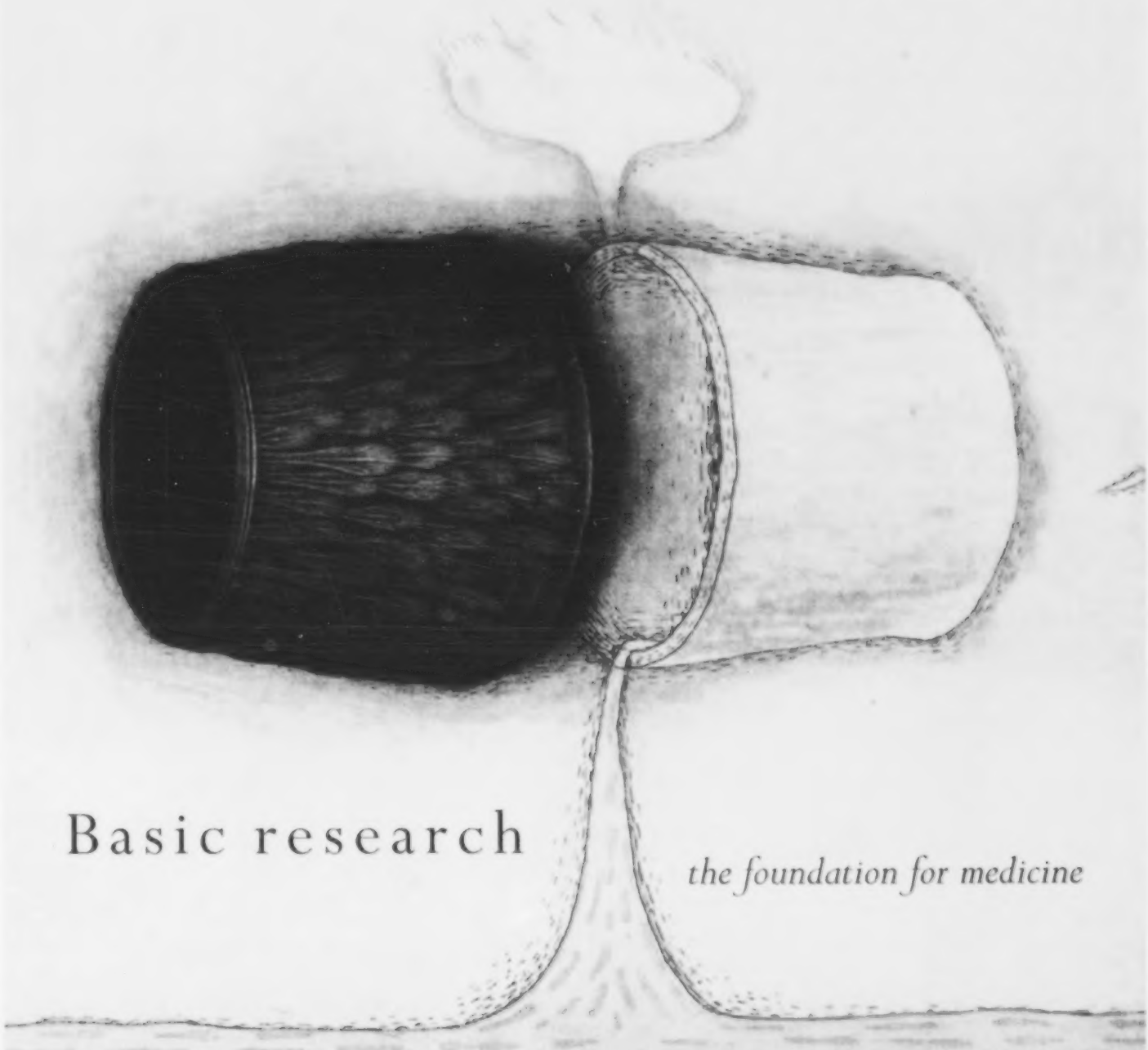
ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

ahfmr research news

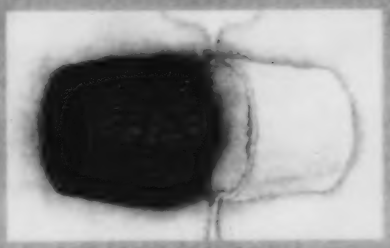
SUMMER 2006



Basic research

the foundation for medicine

On the Cover



Cover artist **Sean Caulfield** is a professor in the University of Alberta Department of Art and Design and holds a Canada Research Chair in printmaking. His recent work has been partly inspired by historic scientific, medical, and botanical illustrations, and explores themes of mutation, metamorphosis, and biology/technology. The cover work is entitled, "The Pouring". ■ Sean's brother Tim is an AHFMR researcher who studies genetics, ethics, and the law, also at the University of Alberta.

research news

ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

SUMMER 2006

AHFMR Mission

AHFMR supports a community of researchers who generate knowledge, the application of which improves the health and quality of life of Albertans and people throughout the world. AHFMR's long-term commitment is to fund health research based on international standards of excellence and carried out by new and established investigators and researchers in training.

Contact Us:

Your comments, views and suggestions are welcome. Please forward them to:

The Editor, AHFMR Research News
Alberta Heritage Foundation
for Medical Research
Suite 1500, 10104 - 103 Avenue
Edmonton, Alberta T5J 4A7

Phone: (780) 423-5727
Fax: (780) 429-3509
E-Mail: ahfmrinfo@ahfmr.ab.ca
Internet: www.ahfmr.ab.ca

AHFMR
ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

Production Notes

Executive editor: Kathleen Thurber
Managing editor: Janet Harvey
Writers: Connie Bryson, Janet Harvey, Barbara Kermode-Scott, Erin O'Connell
Design: Lime Design Inc.
Cover illustration and feature story illustrations: Sean Caulfield
Inside illustrations: Cindy Revell
Photography: Trudie Lee, Brian Harder, Calgary; Laughing Dog Photography, Edmonton; Getty Images

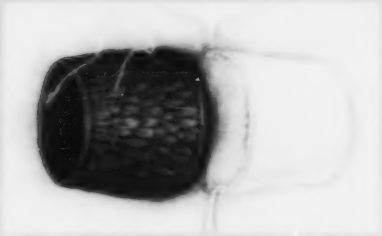
The AHFMR Newsletter is published four times annually and is distributed free of charge to a controlled circulation list within Canada. If you wish to receive it, please contact us by phone, e-mail, fax or by letter. It is also on the web at www.ahfmr.ab.ca.

AHFMR Research News is printed by graffikom.Speedfast on 70lb Luna Matte text.

ISSN 1700-6236 (print) ISSN 1703-5694 (online)

Canadian Publications Agreement #40064910

On the Cover



Cover artist **Sean Caulfield** is a professor in the University of Alberta Department of Art and Design and holds a Canada Research Chair in printmaking. His recent work has been partly inspired by historic scientific, medical, and botanical illustrations, and explores themes of mutation, metamorphosis, and biology/technology. The cover work is entitled, "The Pouring." ■ Sean's brother Tim is an AHFMR researcher who studies genetics, ethics, and the law, also at the University of Alberta.

research news

ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

SUMMER 2004

Inside features

AHFMR Mission

AHFMR supports a community of researchers who generate knowledge, the application of which improves the health and quality of life of Albertans and people throughout the world. AHFMR's long-term commitment is to fund health research based on international standards of excellence and carried out by new and established investigators and researchers in training.

Contact Us:

Your comments, views and suggestions are welcome. Please forward them to:

The Editor, AHFMR Research News
Alberta Heritage Foundation
for Medical Research
Suite 1500, 10104 - 103 Avenue
Edmonton, Alberta T5J 4A7

Phone: (780) 423-5727
Fax: (780) 429-3509
E-Mail: ahfmrinfo@ahfmr.ab.ca
Internet: www.ahfmr.ab.ca

AHFMR
ALBERTA HERITAGE FOUNDATION FOR MEDICAL RESEARCH

Production Notes

Executive editor: Kathleen Thurber
Managing editor: Janet Harvey
Writers: Connie Bryson, Janet Harvey, Barbara Kermode-Scott, Erin O'Connell
Design: Lime Design Inc.
Cover illustration and feature story illustrations: Sean Caulfield
Inside illustrations: Cindy Revell
Photography: Trudie Lee, Brian Harder, Calgary; Laughing Dog Photography, Edmonton; Getty Images

The AHFMR Newsletter is published four times annually and is distributed free of charge to a controlled circulation list within Canada. If you wish to receive it, please contact us by phone, e-mail, fax or by letter. It is also on the web at www.ahfmr.ab.ca.

AHFMR Research News is printed by grafikom.Speedfast on 70lb Luna Matte text.

ISSN 1700-6236 (print) ISSN 1703-5694 (online)

Canadian Publications Agreement #40064910

Given Gail Surkan's long-standing interest in health policy, it seemed a natural step for her to join AHFMR's Board of Trustees in 2000. "Health research is so pivotal to our future. It helps us understand not only how to deliver better treatments, but also how to raise the overall health experience in the province," she explains. "Once I began working with AHFMR and realized its importance to Alberta's families and communities, it was hard not to become more involved."

Indeed. Ms. Surkan is now chair of the board, a position she assumed in November 2005. The trustees are leading the development of a long-term strategic framework for AHFMR. The strategy calls for maintaining AHFMR's core program, which supports health researchers in Alberta, while at the same time developing two new initiatives to build research capacity in the province. In an interview, Ms. Surkan reflected on the need for change.

"When AHFMR was established in 1980, it was one of only a few players in the health-research field in Canada. We demonstrated how effective the funding of people at the highest levels of excellence can be. In 2006, the research-funding environment is very different. There are many other agencies in other provinces and countries—some of them modelled after AHFMR—providing similar kinds of support.

"We believe that Alberta has the capacity to remain on the cutting edge of health research at the national and international level. Therefore, we're moving forward with initiatives that will help us remain competitive in attracting outstanding health researchers to the province, supporting their work, and building a larger health-research vision. The goal is to reposition ourselves while continuing our core program of supporting health researchers at all stages—from basic training for students to long-term support for established scientists."

"Alberta has the capacity to remain on the cutting edge of health research"

The first new initiative is targeted support for a limited number of key research areas of importance to Alberta. The trustees have agreed on a set of principles that will guide the selection of these areas. They include a highly collaborative research environment, interdisciplinary teams, pan-provincial effort, and a clear link to significant health issues in the province. The areas could be those nearing significant breakthrough given existing expertise; or those where there is inadequate research activity given the importance of the research issue.

The second initiative is a major award program to recruit a very small number of research leaders from around the world to Alberta. The awards will be non-renewable, and valued at up to $1 million annually for a maximum of 10 years. They will be given to outstanding health researchers whose work is judged to have major global impact and who have the ability to lead major research developments. These awards are intended to be partnered.

ABOVE: GAIL SURKAN

"These new approaches have come out of consultation with the research community," says Ms. Surkan. "Consultation continues, and we expect refinements.

"It would be easy to try to be all things to all people, but that would dissipate the effect. Focus is important. Far-sightedness is important. You'll see both focus and a long-term view as AHFMR moves forward with new initiatives, new partners, and new ways of approaching issues. To have the opportunity to be involved at such a creative time in this organization is personally and professionally rewarding. When does it get better than that? Well, it gets better when you realize how pivotal the work of AHFMR is to the future of Alberta and Canada.

"I'm a new grandmother. The future is on my mind. I can't help but feel this is an area where my efforts are well placed."

Gail Surkan is chair of the AHFMR Board of Trustees and a member of the University of Alberta Board of Governors. She served as both chair and vice-chair of the Provincial Health Council, a body created to evaluate health reform and report to the Alberta Legislature. Ms. Surkan was mayor of Red Deer from 1992 to 2004 after serving on Red Deer City Council from 1986 to 1992. She has extensive experience as a consultant and analyst in various fields, including strategic planning, tourism, Northern communities, regional development policy, and economic development.

responding to the reader

AHFMR frequently receives letters requesting information about Heritage research or about various medical conditions. "Responding to the Reader" is an *AHFMR Research News* feature intended to provide up-to-date information related to readers' questions, with the help of experts in the Alberta research community. AHFMR cannot provide medical advice, however; please see your family physician about your specific health concerns.

> In the orthopaedic field, hip replacement is one of the most common major surgical procedures done in Canada. Known technically as *total hip arthroplasty*, the surgery has been performed around the world for more than 40 years. It removes diseased or fractured bones of the hip joint and replaces them with artificial components. The major indication for hip replacement is chronic pain that does not respond to medical treatment; the cause of the pain and disability is usually arthritis. A reader has asked about outcomes of hip-replacement surgery. To answer this question, we spoke with Dr. Bill Johnston, an Edmonton orthopaedic surgeon who specializes in arthroplasty surgery and who has done research on outcomes following total joint arthroplasty and hip fractures in elderly patients.

"Total hip arthroplasty is a very successful procedure in giving people back a functional quality of life," he says. "The patients who need the procedure are in significant pain, which prevents them from working, doing any kind of recreational activity, or even managing activities of daily living. When you see patients six weeks after the operation—walking without crutches or canes—they are different people. Their smiles tell the story."

Dr. Johnston notes that outcomes for total hip arthroplasty have continually improved because of advances in both the materials used to make the prostheses and the surgical techniques employed. These improvements have led to a rethinking of the age considered appropriate for surgery. Twenty years ago, hip replacements were done mainly in individuals older than 65 and younger than 80. Now hip replacements are done in people in their 50s and people well into their 80s.

There are three elements to an artificial hip joint: a stem that is inserted into the femur (thigh

"Total hip arthroplasty is one of the most successful surgical procedures ever devised"

bone); a ball to replace the head of the femur; and a cup that is inserted into the pelvis. Titanium alloys have been used for the stem for about 10 years. While titanium is very strong, it does not make a good surface for the ball and cup. Other options for surfaces now include cross-linked polyethylene (as a lining for the cup), metal balls, ceramic cups and balls, and all-metal cup and balls.

To help them decide what kind of hip joint to use, orthopaedic surgeons use research results obtained by tracking outcomes for patients with different types of prostheses.

Surgical techniques have also improved over the years. One major trend is toward smaller incisions. Dr. Johnston now routinely uses an incision about 10 to 12 centimetres long, compared to the traditional 20-centimetre incision, but not every patient qualifies for this approach. "I advocate using the size of incision that lets you do the operation safely and at a high standard of quality."

Patients can enhance their own outcomes, especially by losing weight before the operation. Rehabilitation is also very important. "We used to tell people to take it very easy after the operation," says Dr. Johnston. "Now patients are standing and walking on either the day of surgery or the next day. We recommend weight-bearing as tolerated, and this more aggressive approach to rehabilitation has decreased complications such as blood clots.

"I tell patients they have a 95-percent chance of a good result, lasting at least 15 years. Total hip arthroplasty is one of the most successful surgical procedures ever devised. It gives people their lives back."

"It gives people their lives back"

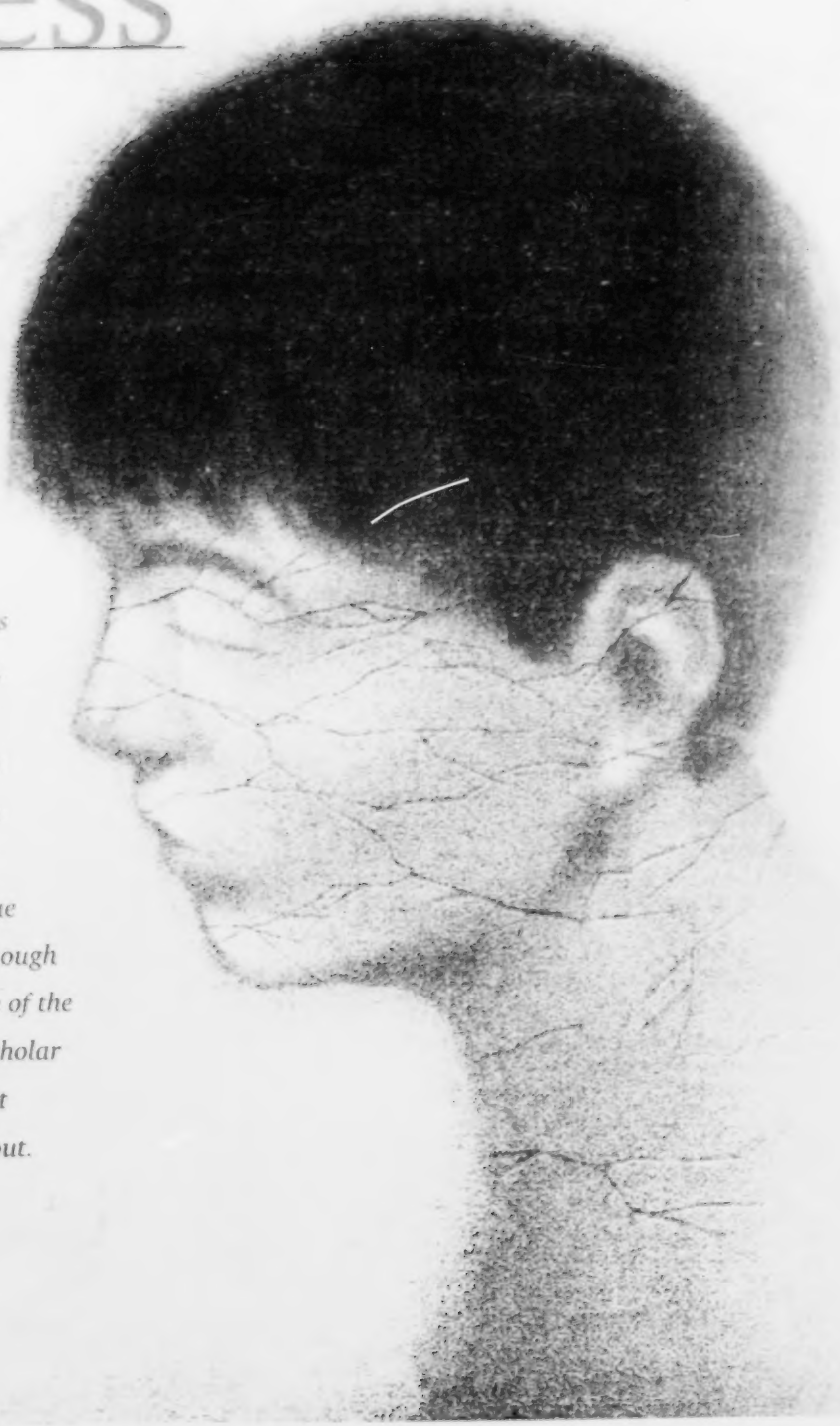
ABOVE: DR. BILL JOHNSTON

Dr. Bill Johnston is an orthopaedic surgeon and clinical professor in the Department of Surgery in the Faculty of Medicine and Dentistry at the University of Alberta. He is also a site medical director of the University of Alberta and Stollery Children's hospitals. *He received support from the Health Research Fund, administered by AHFMR on behalf of Alberta Health and Wellness, for his study entitled "The effect of patient comorbid conditions on pain and functional recovery after total hip and knee arthroplasties".*

Fatigue AND illness

WHY DO WE FEEL TIRED WHEN WE'RE ILL?

In many illnesses—such as cancer, multiple sclerosis, rheumatoid arthritis, and liver disease—as well as infections, fatigue can be a major issue. Brain function drives the fatigue in these diseases, even though all of them occur outside of the brain, AHFMR Senior Scholar and Calgary hepatologist Dr. Mark Swain points out.



"WHEN WE BECOME SICK with the flu or a bacterial infection, we feel tired, as well as losing our appetite and so on," explains Dr. Swain. "The body signals the brain to produce these symptoms or behaviours. It's important for us to conserve energy and not move around and do things–so we'll get over the illness and get back to normal. Unfortunately, with a chronic disease, we don't get over the illness. The stimuli to the brain keep happening. Our bodies try to adapt but they never fully do so."

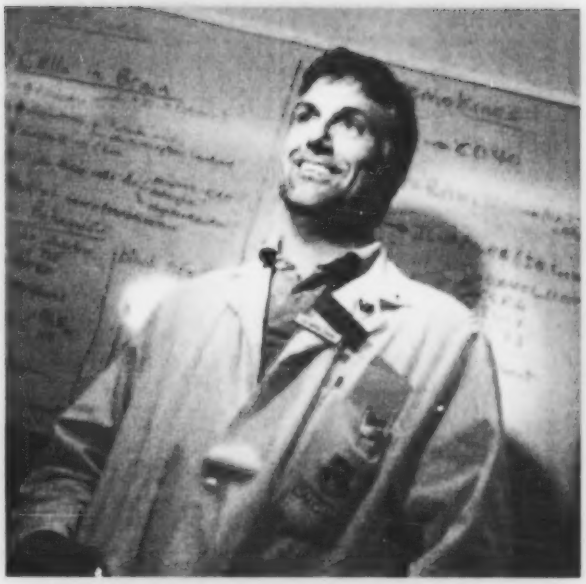
Throughout his career as a physician and researcher, Dr. Swain has attempted to improve the quality of life and health outcomes for people suffering from liver disorders. More than 100 known forms of liver disease affect everyone from infants to older adults. Liver damage can result from viruses, cancer, autoimmune disorders, alcohol, drug use, toxins, and obesity.

Dr. Swain studies, diagnoses, and treats such liver problems as hepatitis, cirrhosis, fatty liver disease, and liver cancer. He investigates the basic mechanisms of liver inflammation and the changes in neurotransmission within the brain that occur in the context of liver disease. He is especially fascinated by the effects of liver damage on symptoms in liver disease, particularly fatigue. Dr. Swain studies how the liver might signal the brain, with the end result that the person feels tired.

"FATIGUE CAN BE THE MAIN FEATURE OF MANY FORMS OF LIVER DISEASE"

Fatigue is the symptom most commonly mentioned by people with liver disease, but its cause is a puzzle. Since fatigue is an unspecific symptom (in other words, it can be caused by a variety of health problems), it is difficult to determine whether it is caused by the liver disease or by something else, or by a combination of factors. This is one reason why fatigue is difficult to study, understand, and treat.

Many people with very severe liver disease suffer what is called peripheral fatigue as a result of muscle atrophy. Patients with less severe disease often experience fatigue not related to muscle deterioration: that is, fatigue that comes from changes occurring within the brain. The severity of the fatigue in these individuals does not relate to their liver function. This means that some people who have severe liver damage may not feel tired at all, while others with minimal liver damage may feel totally exhausted.



ABOVE: DR. MARK SWAIN

"Fatigue can be the main feature of many forms of liver disease, and can be anywhere from mild and trivial to completely incapacitating," explains Dr. Swain. "The thing that's most difficult is that there's no correlation between the severity of the fatigue and the severity of the liver disease. Some people will say, 'If I have cirrhosis, why do I feel so good?' Others will say, 'Why do I feel so bad?' I think, inherently, some people are more tired than others because of the different ways individuals adapt to the signals which their bodies are sending to their brain." Dr. Swain hopes that his research may someday allow physicians to better target the treatment of fatigue as a symptom, improving quality of life for patients with liver disease and possibly for those with other chronic diseases as well.

Dr. Mark Swain is an AHFMR Senior Scholar and a professor in the Department of Medicine at the University of Calgary. He receives funding from the Canadian Institutes of Health Research (CIHR).

Selected publications

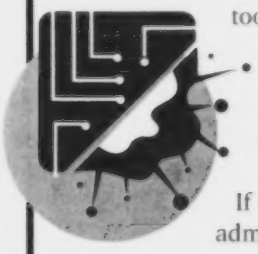
Swain MG. Fatigue in liver disease: pathophysiology and clinical management. *Canadian Journal of Gastroenterology* 2006 Mar;20(3):181-188.

Kerfoot SM, D'Mello C, Nguyen H, Ajuebor MN, Kubes P, Le T, Swain MG. TNF-a-secreting monocytes are recruited into the brain of cholestatic mice. *Hepatology* 2006 Jan;43(1):154-162.

Spurred by the success of blockbuster documentaries such as *Supersize Me* and best-selling books detailing the inner workings of the fast-food industry, the public's interest in nutrition and health is on the rise. But despite the media attention and increased awareness, academic research related to this subject is failing to address certain segments of the population. One group in particular that has been neglected is adolescents. Dr. Linda McCargar, a University of Alberta professor specializing in human nutrition, uses the technology of the World Wide Web to find out more about the lifestyle choices and nutritional habits of Alberta kids in grades 7 to 10.

Adolescent **nutrit**

"When we look at the wide body of academic literature out there, there is some information on nutrition behaviours in younger children and adults; however, very little is known about adolescents. The challenge [kids in] this age group face is that they're becoming more independent regarding their food and activity choices; they have to make decisions away from home and under the influence of their peers. We are interested in knowing what choices they are making and why." Dr. McCargar hopes to use research not only to record lifestyle behaviours for this group, but ultimately to evaluate change in school nutrition policies.



"The web-based survey is a great tool for this type of study," she says. "The students in the Grade-7 to -10 age group are computer-savvy, so it's very easy for them. The teachers get involved, and it allows us to reach more schools. If we had to go to each school to administer the survey, it would drastically reduce the number of students we could reach. Instead, the students do the survey during the school day, and researchers at the university can access the information electronically."

"Adolescents are becoming more independent regarding their food and activity choices"

The survey asks students direct questions about their food and physical activities. It also probes deeper and asks them about where they eat, how much confidence they have that they are choosing the right foods, and what factors influence their decision-making. The survey uses visuals of different-size containers and asks each student to choose the one representing the amount of a particular food eaten. Dr. McCargar believes that this web-based approach is easier to use and generates more accurate data than traditional paper surveys. Its combination of questions on both nutritional and physical activity also makes it a strong study.

"Nutrition and physical activity go hand in hand with regard to chronic-disease prevention," explains Dr. McCargar. "Today's adolescents are tomorrow's adults, and their behaviour today will influence

ABOVE: DR. LINDA MCCARGAR

their health in the future. The long-term consequences of unhealthy lifestyles don't pose an immediate concern to young people. We want to get the message out that the benefit of eating well and incorporating physical activity into everyday life isn't just about weight. It's about having energy, feeling good, being alert at school, and performing well."

"Their behaviour today will influence their health in the future"

Dr. Linda McCargar receives support through the Health Research Fund, administered by AHFMR on behalf of Alberta Health and Wellness. She is a full professor in the Department of Agricultural, Food and Nutritional Science in the University of Alberta's Faculty of Agriculture, Forestry, and Home Economics. Dr. McCargar received the YWCA Woman of Distinction Award in Health and Medicine for 2005 and was named 2005 Woman of the Year by the Academic Women's Association at the University of Alberta. Dr. McCargar's research is also supported by the Canadian Institutes of Health Research (CIHR) and the Alberta Diabetes Foundation (ADF).

Selected publications

Deegan H, Bates HM, McCargar LJ. Assessment of iron status in adolescents: dietary, biochemical and lifestyle determinants. *Journal of Adolescent Health* 2005 Jul;37(1):75.e15-75.e21.

Ball GDC, McCargar LJ. Childhood obesity in Canada: a review of prevalence estimates and risk factors for cardiovascular diseases and type 2 diabetes. *Canadian Journal of Applied Physiology* 2003 Feb;28(1):117-140.

ion and **lifestyle**

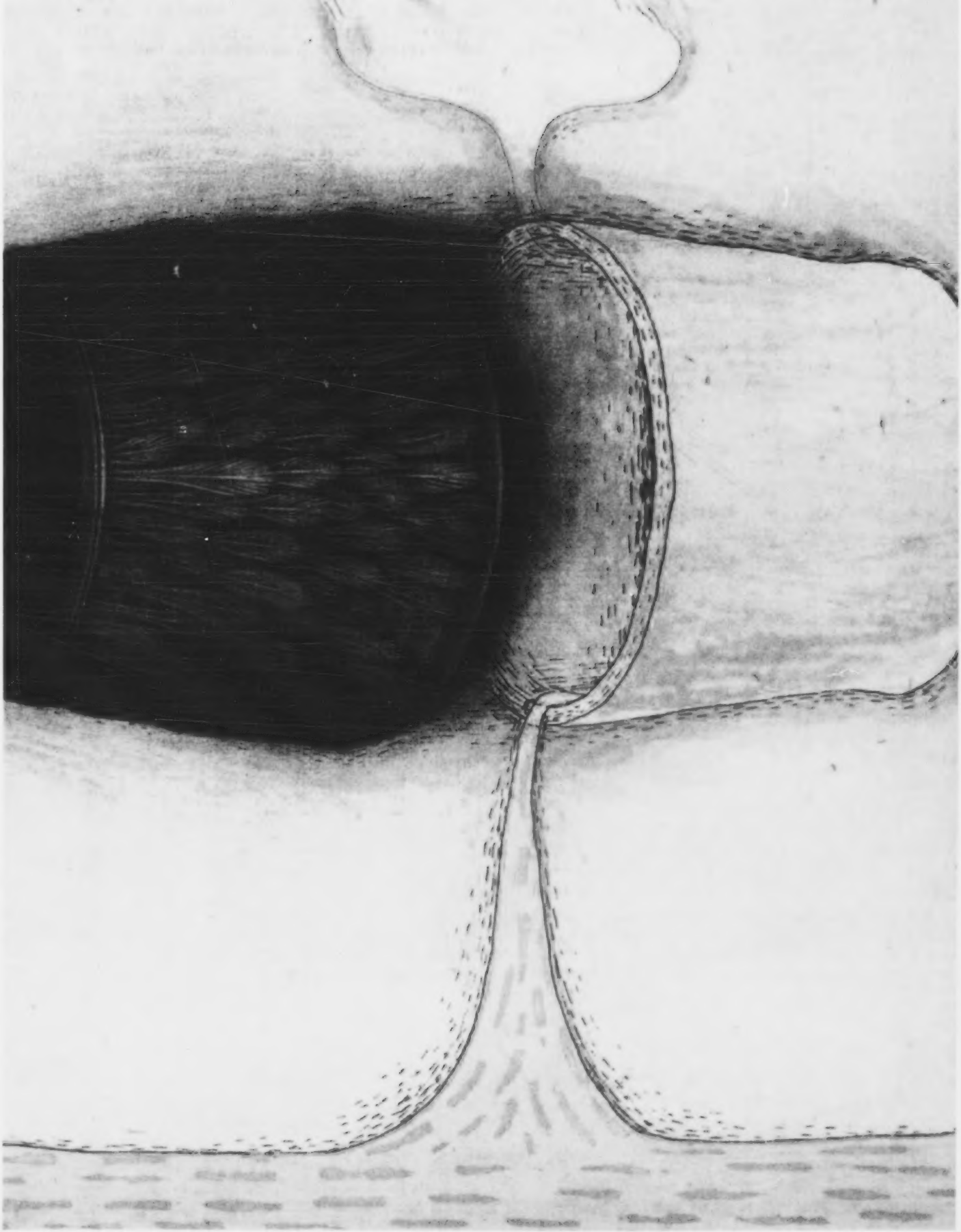
Basic research
the foundation for medicine

The pages of this magazine regularly feature stories on research related to cells, molecules, proteins, lipids, and genes—things not only invisible to the naked eye, but also, for many of us, difficult to grasp as concepts. "What does this work have to do with my health?" a reader may ask. "How will this research translate to better treatments for cancer, Alzheimer's, heart disease, or the many other serious illnesses that take a toll on our lives?"

THIS TYPE OF WORK IS CALLED *BASIC RESEARCH*. It is the study of a research question or area which may have no immediate clinical application—the pursuit of knowledge for the sake of knowledge. Yet basic research has proven essential time and again, resulting in vital medical advances. Penicillin, for example, was discovered by a scientist who noticed that a mould had dissolved the bacteria growing in a petri dish. Some 15 years later, that mould had been isolated and was being used clinically to treat infections.

Such a delay between breakthrough and clinical use is a feature of basic research, Heritage Scientist Dr. Susan Lees-Miller explains. "I don't think people realize how long science takes. We're talking 5 to 10 years before finding out that something might have therapeutic potential, and then another 5 to 10 years to actually find out if it will be useful in the clinic. And the answer may turn out to be no. But along the way, we've generated all of this other information. You never know if what you're working on will turn into something useful. That's why funding basic, curiosity-driven research is so important: It is the foundation from which all of the more clinical and translational projects derive." **Page 10 ▸**

ABOVE: DR. SUSAN LEES-MILLER



"I don't think people realize how long science takes"

DNA damage

After nearly 15 years of work at the University of Calgary, Dr. Lees-Miller has contributed substantially to this groundwork. She studies how cells detect DNA damage caused by radiation and how they respond to it. This area is clinically relevant, because at least half of all cancer patients receive radiation therapy. And, while radiation has been used to treat people for many years, it is only in the past 10 years or so that we have gained an understanding of how radiation-induced DNA damage is detected and repaired in these cells. Dr. Lees-Miller draws an analogy here: "If your car breaks down, there is no point in changing the tire if the thing has run out of gas. If you want to manipulate this process to kill cancer cells more effectively, you have to know how it works."

The application of radiation in cancer treatments involves a gene known as *ataxia-telangiectasia mutated* (ATM)—a major player in detecting and repairing DNA damage. It turns out that ATM is deleted or mutated in 20% to 50% of mantle cell lymphoma cases (a fairly common non-Hodgkin's cancer that mainly affects men in their 60s). That information may allow researchers to predict how the cancer cells will respond to radiation. If ATM is not present to mend the radiation damage, therapy could be designed to target the backup repair pathways, and lower doses of radiation might be sufficient to destroy the cancer cells.

"What drives basic scientists is this curiosity—*how* does the cell function, *how* does it carry out all these complex roles?" says Dr. Lees-Miller. "Although I'm certainly a basic scientist at heart, my field has matured enough so that we're ready to start asking more clinical and translational questions." She points to mantle cell lymphoma to illustrate her point. "Before we knew that ATM was deleted in this lymphoma, and before we knew ATM's function, there was no way we could come up with ideas on how to target those pathways. But with 10 to 15 years of basic science telling us how that protein functions, we can start to kill cancer cells more efficiently by targeting different pathways, instead of treating all cancers one way. You can't make those kinds of hypotheses or do those kinds of experiments unless you have the basic research behind you."

Cell sorting

University of Alberta Heritage Scientist Dr. Paul Melançon agrees. "We never quite know where the next penicillin or the next dramatic improvement in health will come from," he says. "But I don't think about this every day. Like most scientists, I want my work to be relevant to human health, but that is not what drives day-

ABOVE: DR. SUSAN LEES-MILLER
RIGHT: DR. PAUL MELANÇON

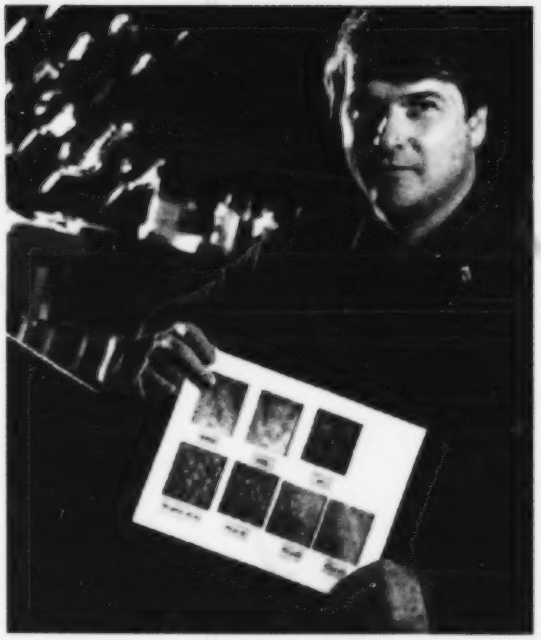
to-day experiments. I want to figure out how things work. I am fascinated by the complexity of the cell. How is it possible that all of these molecules sort themselves out to yield the intricate organization we observe under the microscope?"

Dr. Melançon focuses his studies on the *Golgi complex,* one of the so-called organelles (compartments) of the cell. He explains that this organelle plays a key processing-and-sorting role in the cell, acting like its central post office. A lot of material goes in, becomes modified, and comes out bound for different destinations.

Dr. Melançon investigates the physical means by which the Golgi complex accomplishes this function. Sorting is performed by special proteins that re-order content, as well as produce the small carriers that ferry cargo between places in the cell. The particular protein he studies ensures that the material goes to the Golgi complex and is sorted away from the other material.

"This is a key step," he emphasizes. "There is a significant number of human diseases, many of them genetically inherited, whose molecular basis originates at this sorting step. Recent studies revealed that even Alzheimer's disease involves processing enzymes that are sorted at this step. It may well be that as we better understand the regulation of this quality control, we will be able to collaborate on better treatments of Alzheimer's and other disease."

"We never quite know where the next dramatic improvement in health will come from"

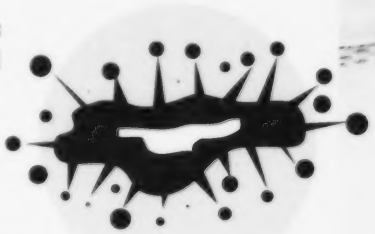


ABOVE: DR. ELMAR PRENNER

Lipids

AHFMR Scholar Dr. Elmar Prenner shares this fascination with the intricate workings of the cell membrane and its many functions. His research in the University of Calgary's Faculty of Science focuses on the role of *lipids* in biological membranes. Lipids are water-insoluble fatty substances that provide a structural framework for the cell, forming a stable barrier by shutting out water. Dr. Prenner points out that, while a lot of current research focuses on various cellular proteins, the biological role of lipids is much less understood.

"Lipids exist in various ratios, depending on cell type or cell substructures," he states, "and these ratios may have a role." He explains that the two major components of mammalian cells (phosphatidylcholine and sphingomyelin) combine with cholesterol to form *lipoproteins.* Different lipoprotein subclasses transport cholesterol in the body and vary significantly in their lipid ratios. Dr. Prenner's laboratory investigates whether these ratios play a role in how the lipids and proteins interact to form lipoproteins.



In addition, some lipids form distinct "islands" called domains, or even more complex structures called *lipid rafts* which involve proteins. "Lipid rafts play a role in signalling but also provide docking points for pathogens from outside the cell," he says. Recently Dr. Prenner's group managed to image very distinct domains of membrane proteins on their own.

Some of Dr. Prenner's other recent work has involved a class of lipids called *ceramides* that act as intracellular signals but also form membrane

Page 13 ▸

The mechanics of osteoporosis

Basic science is not just cellular-level research. Ask Heritage Scholar and mechanical engineer Dr. Steven Boyd. The University of Calgary researcher studies bone architecture to determine the causes of bone loss in diseases such as osteoporosis.

DR. STEVEN BOYD

Dr. Boyd uses micro-CT (computer tomography) to obtain images of the bones of mice and rats. By means of x-ray technology, his scanner captures high-resolution images which are then processed by computer to create very accurate three-dimensional pictures of the bone. Dr. Boyd studies the effects of exercise and various drugs on the progression of osteoporosis; the scanner allows him to see exactly which part of the bone is thinning. He also examines the influence of different genetic traits on bone. "The tools that we develop for basic research with animals translate directly for use on humans," he says.

In fact, Dr. Boyd is doing the translating. He also examines the structure and mechanics of human bones using another micro-CT scanner at the University of Calgary Faculty of Kinesiology. This machine is the only one in Canada (and one of only four in North America) used to scan humans. "It's very exciting because, for the first time, this machine allows us to measure 3-D bone architecture in people," says Dr. Boyd.

"Basic research allows us to explore treatments before they're ready for the clinic"

The bone architecture that concerns him most is that of the wrist. "The bottom line in osteoporosis is fracture," says Dr. Boyd. A fracture of the wrist is usually an early warning sign of the disease and can forecast increased risk for future hip and spine fractures. "So we want to know what changes happen to the wrist, and how these relate to fracture."

While Dr. Boyd's second micro-CT is a research scanner that likely won't be found in clinical use soon, he is quick to emphasize the relevance of his work to human health. "Basic research is important because it allows us to explore effects of osteoporosis treatments in detail before they're ready for the clinic."

AHFMR Scholar Dr. Steven Boyd is an assistant professor in the Department of Mechanical and Manufacturing Engineering at the Schulich School of Engineering, with a joint appointment in the Faculty of Kinesiology at the University of Calgary. His research is also supported by CIHR, NSERC (Natural Sciences and Engineering Research Council of Canada), and the Canada Foundation for Innovation.

Selected publication

Boyd SK, Davison P, Müller R, Gasser JA. Monitoring individual morphological changes over time in ovariectomized rats by in vivo micro-computed tomography. *Bone. Prepublished online 2006 June 6; doi: 10.10.16/j.bone-2006-04-017.*

Dr. Prenner's research may help us understand the role of lipids in atherosclerosis or Alzheimer's

domains. Ceramide content is increased in Alzheimer's disease and has been shown to promote the progression of the disease. However, the binding of a protein called apo E to ceramide domains helps prevent *atherosclerosis* (hardening of the arteries).

Dr. Prenner points out that his research, while very basic in nature, may contribute to a better understanding of the role of lipids in diseases such as atherosclerosis or Alzheimer's.

Bacteria

Instead of the internal complexities of the cell itself, AHFMR Scholar Dr. Tracy Raivio at the University of Alberta focuses on external threats to the cell: bacteria. Bacteria are everywhere; and because they can live in very different environments (*E. coli*, for example, can live not only in our gut but also in food and water), they have to be able to change their physiology to adapt. *Gene expression* (the process by which a gene is switched on) changes each time a bacterium moves to a different environment. "What we want to know is, how does the bacterium know it's in a different environment, and how does it transduce that into a change in gene expression?"

To address these questions, Dr. Raivio looks at one particular pathogen called enteropathogenic *E. coli*. She explains that this form of *E. coli* is not a big health threat in North America; it mainly infects infants in developing countries. However, the pathogen uses infection mechanisms that mimic those in the other types of *E. coli* and such other disease-causing organisms as *Salmonella, Shigella,* and *Yersinia*.

When they infect a host cell, these bacterial pathogens produce a set of proteins called *virulence factors,* which allow them to cause the symptoms of infection. Almost all of these virulence factors are found in the *envelope* (the outermost compartment) of the bacterium or are secreted across the envelope. Dr. Raivio focuses on *envelope stress responses,* bacterial signal pathways that recognize changes in the bacterial envelope. Some changes causing proteins to misfold in the envelope activate something called the CPX pathway. "One of our theories is that the CPX stress response might be involved in sensing when these virulence determinants are expressed, and in helping to fold them and make sure they're functional," says Dr. Raivio. She hopes that, based on this work, a new antimicrobial drug targeting this pathway could some day be developed to treat these pathogens.

While that kind of application for such basic research may be very far away, Dr. Raivio gives a very good example of how seemingly obscure research can uncover information crucial to human health. During her post-doctoral work at Princeton, Dr. Raivio worked down the hall from a scientist named Dr. Bonnie Bassler, who studied particular marine bacteria that live in squid. When the bacteria reach a certain density they give off light—a symbiotic relationship that helps the squid hide its shadow as it hunts on moonlit nights. With no obvious human application to the work in sight, Dr. Bassler identified the mechanism the bacteria use to sense their own numbers so they can regulate the amount of light emitted according to bacterial cell density. It turns out that this

RIGHT: DR. TRACY RAVIO

Page 14 ▸

"Often an application for human health will spring from something that nobody would have seen coming"

number-sensing mechanism is found in many pathogens, enabling them to sense when their numbers are great enough to overpower a host. It was a landmark discovery that provided information crucial to finding new ways to help fight deadly bacteria.

"Basic research is very important and is often in danger of being neglected," summarizes Dr. Raivio. "There is always a push to fund things for which the human application is really obvious. And that's understandable because the money comes ultimately from the public. But you never know from where the next flash of insight to help make our lives better will come. I don't think we are smart enough to know exactly which area of science we need to study to do the things we want to do for humanity, so it is really important to fund basic research in a lot of different areas. Often an application for human health will spring from something that nobody would have seen coming."

T cells

AHFMR Scientist Dr. Chris Bleackley elaborates with another example. "Just about every drug currently out there has been developed on the basis of basic research," he points out, explaining that many of the newer therapies have been created through genetic engineering. This allows researchers to design and make novel proteins as potential drugs and is based on something called restriction enzymes. These enzymes were discovered over 30 years ago by scientists doing basic research in bacteria. "This was something which, on the face of it, had no clinical relevance whatsoever, [but which] is now used extensively," says Dr. Bleackley. Recent examples include Herceptin for treatment of breast cancer, Enbrel for arthritis, and human insulin for diabetes.

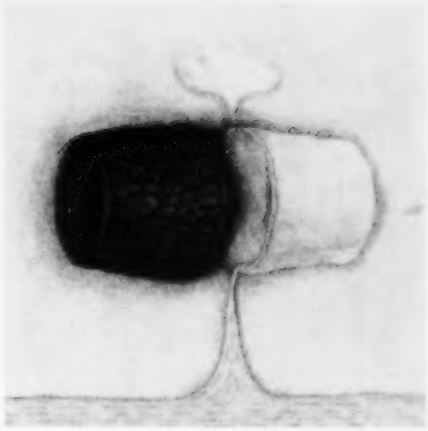
Dr. Bleackley's own groundbreaking work also has the potential for many applications. His research focuses on cells called cytotoxic lymphocytes, also known as *killer T cells.* Millions of these T cells circulate in an inactive state in our bodies. During an immune response stimulated by a virus, for example, T cells reproduce until there are billions of them; they destroy the virus-infected cell, and then they start dying themselves until a baseline level of inactive cells is reached, and the immune system goes back to a resting stage.

T cells protect us from viruses and bacteria, and they are involved in the destruction of cancer tumour cells. That's their good side. The bad side is that T cells can react against the healthy cells of the body, leading to autoimmune diseases such as diabetes and rheumatoid arthritis. Dr. Bleackley wants to understand how these cytotoxic T cells work at the molecular level in order to influence the

"Just about every drug has been developed on the basis of basic research"

RIGHT: DR. CHRIS BLEACKLEY

activity of the cells. In other words, if someone's immune system is not functioning well enough to destroy a tumour cell, the cytotoxic T cells could be stimulated to help. Or the T cells could be deliberately suppressed to prevent rejection in a patient who has received an organ transplant. "The basic hypothesis is that if you can understand these cells, you can influence their activity either up or down for therapeutic value," he says.



Dr. Bleackley has already contributed a great deal to our understanding of how the T cells work. In 1986, he discovered that killer T cells express a family of molecules called *granzymes* when activated. When the killer cells interact with a tumour or a virus-infected cell, the granzymes are transferred into the tumour cell and flick a molecular switch causing the tumour cell to die by a process known as *programmed cell death* (apoptosis). "We're starting to now get into why some tumours do not die when the switch is flicked," he says. "It turns out they are able to express molecules that can block this cell death."

Dr. Bleackley collaborates with a number of colleagues to pursue the many potential clinical uses for his work. Working with Dr. Phil Halloran at the University of Alberta, Dr. Bleackley looks at using molecular tools to study kidney-transplant rejection. He also works with a geriatrician at the University of British Columbia to study influenza in elderly patients who don't respond as well as they should to vaccines. And with Edmonton Protocol pioneer Dr. Ray Rajotte, he investigates molecules that could be mobilized to suppress rejection of islet transplants in diabetes treatment. "I have a great interest in seeing the molecular tools we've developed used in clinically relevant situations," says Dr. Bleackley.

But these clinical uses may still take many years. "The human body is incredibly complicated, and it can take a long, long time to understand it at the molecular level," explains Dr. Bleackley. In the first place, the science discovery stage may take a long time. Then a compound developed from this discovery must go through a series of clinical trials that also take a long time. But the results may change lives.

"Many people have been cured of many different things through the benefits of basic research," emphasizes Dr. Bleackley. "It is fundamentally important for the future of human health."

Dr. Susan Lees-Miller is an AHFMR Scientist and a full professor in the Department of Biochemistry and Molecular Biology in the University of Calgary Faculty of Medicine. In addition to Heritage support, she receives funding from the Canadian Institutes of Health Research (CIHR), the Alberta Cancer Board, and the National Cancer Institute of Canada (NCIC).

Dr. Paul Melançon is an AHFMR Scientist and a full professor in the Department of Cell Biology in the University of Alberta Faculty of Medicine and Dentistry. His research is supported by CIHR and the Human Frontier Science Program.

Dr. Elmar Prenner is an AHFMR Scholar and an assistant professor in the Department of Biological Sciences in the Faculty of Science at the University of Calgary. His research is supported by the Natural Sciences and Engineering Research Council of Canada (NSERC).

Dr. Tracy Raivio is an AHFMR Scholar and associate professor in the Department of Biological Sciences in the University of Alberta Faculty of Science. In addition to AHFMR support, she receives funding from CIHR and NSERC.

Dr. Chris Bleackley is an AHFMR Scientist and full professor in the Department of Biochemistry at the University of Alberta. He is a Canada Research Chair in Molecular Biology and an International Research Scholar of the Howard Hughes Medical Institute. His research is also supported by CIHR and NCIC.

Selected publications

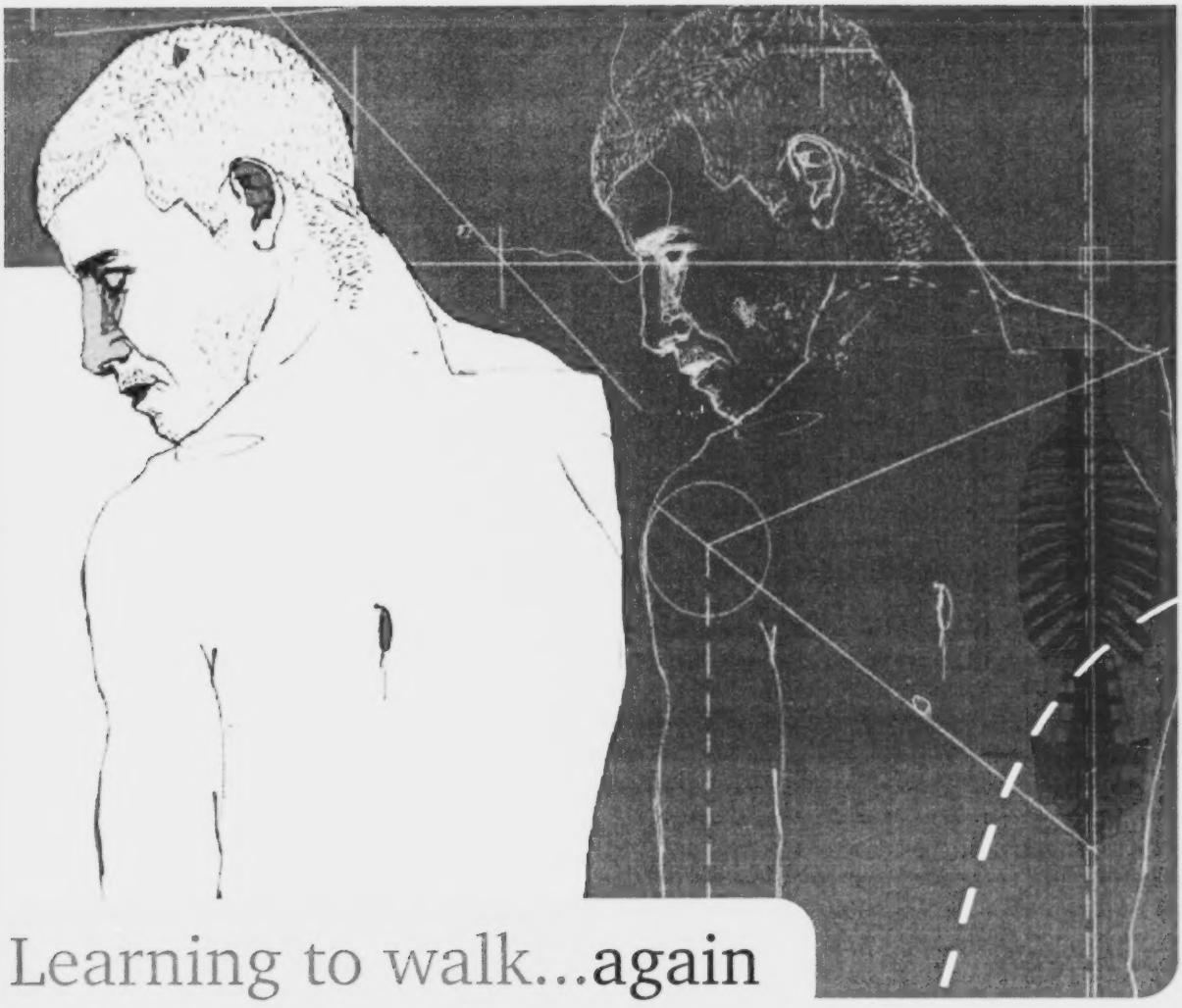
Goodarzi AA, Jonnalagadda JC, Douglas P, Young D, Ye R, Moorhead GBG, Lees-Miller SP, Khanna KK. Autophosphorylation of ataxia-telangiectasia mutated is regulated by protein phosphatase 2A. *EMBO Journal* 2004 Nov 10;23(22):4451-4461.

Dunphy JL, Moravec R, Ly K, Lasell TK, Melançon P, Casanova JE. The Arf6 GEF GEP100/BRAG2 regulates cell adhesion by controlling endocytosis of beta1 integrins. *Current Biology* 2006 Feb 7;16(3):315-320.

Raivio TL. Envelope stress responses and Gram-negative bacterial pathogenesis. *Molecular Microbiology* 2005 Jun;56(5):1119-1128.

Veugelers K, Motyka B, Frantz C, Shostak I, Sawchuk T, Bleackley RC. The granzyme B-serglycin complex from cytotoxic granules requires dynamin for endocytosis. *Blood* 2004 May 15;103(10):3845-3853.

"It is fundamentally important for the future of human health."



Learning to walk...again

Human motion is complicated, to say the least. Many of us take for granted the ease with which we move; we grumble about walking the dog or having to park the car at the far end of the parking lot. But for those suffering from a spinal cord injury, walking can be a daunting task, if not an impossible one. AHFMR Senior Scholar Dr. Monica Gorassini works to help people with spinal cord injuries walk again.

The ability to walk is the result of special circuitry; output from the brain travels through the spinal cord to stimulate the relevant muscles. In order for a person to recover the ability to walk after a spinal cord injury, some connections between the brain and the muscles via the spinal cord must remain intact. *Partial spinal cord injuries* are the research focus of Dr. Gorassini, an assistant professor at the University of Alberta. Her work indicates that, while retained connections may be enough to promote recovery of some walking ability, specialized training can significantly increase the amount of movement that patients with partial spinal cord injuries can regain.

The ability to walk is the result of special circuitry

"I like to compare those recovering from partial spinal cord injuries to athletes," says Dr. Gorassini. "If you want to see results, you have to train hard. The type of training that we do with these patients is very intensive. Treatment typically consists of surgery followed by a four-month stay at the Glenrose Rehabilitation Hospital. After the patients have been released from the Glenrose, the therapy and the contact they have with physical therapists are limited. This is where we have some ability to help."

Dr. Gorassini and her colleagues typically work with patients who have received some physical therapy but are no longer improving. They put these patients through a demanding program of specialized treadmill training to strengthen connections and improve walking ability.

Strengthening complex connections

"Does intense motor training on a treadmill, using assistance from therapists, increase the strength of the residual connections from the brain to the spinal cord? The answer is yes, it does," says Dr. Gorassini. "Even if someone has been injured for 20 years, we can train them and increase the strength of the residual connections from the brain by about 50 percent." In fact, the number of spared connections relates directly to the extent of functional improvement these patients achieve.

For maximum recovery, the descending connections from the brain to the spinal cord need to be enhanced. While treadmill walking can increase connection strength and may even help to form new connections, stimulating the brain itself may be the secret to helping these patients recover the greatest possible movement. Dr. Gorassini uses a specialized piece of equipment called a *transcranial magnetic stimulator.* Resembling a metal hat, the stimulator generates a current in the brain when placed on a patient's head.

"Essentially we want to put the brain into a state of excitability that makes it most responsive to motor training," says Dr. Gorassini. "By using a combination of treadmill training and brain stimulation, we may be able to get motor recovery that is better than [what we can achieve] with training alone."

"If you want to see results, you have to train hard"

A lifelong interest

Dr. Gorassini's fascination with the workings of the nervous system began at an early age. An avid baseball player in her youth, she would frequently dislocate her thumb. "My mom used to send me to a chiropractor who was really busy," she remembers. "I would usually end up sitting in the waiting room studying a poster of a human body with the nervous system all mapped out. I remember thinking, 'I would love to figure out how all of that works.'" The memory of that poster spurred Dr. Gorassini to pursue a career in neuromuscular research that began at the University of Guelph, then took her to Europe, and ultimately led her to the University of Alberta.

Her work with treadmill therapy began in 1999, shortly after she attended a meeting on regeneration and rehabilitation where she saw a presentation by a researcher named Anton Wernig. His amazing videos showed patients with spinal cord injuries

who had been trained, and demonstrated the extent of their recovery–far above and beyond what could be achieved in standard rehabilitation care. "I thought, 'I have to try this!'" says Dr. Gorassini.

"And the long-term benefits it has had in the lives of the people we've trained are immeasurable." To date, Dr. Gorassini has been involved in training 40 patients. Many who were wheelchair-bound before the training can now walk with canes or crutches.

The real challenge of transferring this research to the clinic lies in the cost of the equipment and of the staff who carry out the training. "There are people out there who want this therapy. It is a lot of work for them, but they are willing to do it. Unfortunately cost is often the limiting factor," says Dr. Gorassini. "The bottom line is that these patients need more rehabilitation, and they should be receiving the best care."

Dr. Monica Gorassini is an AHFMR Senior Scholar and an assistant professor in both the Department of Biomedical Engineering and the Centre for Neuroscience within the University of Alberta Faculty of Medicine and Dentistry. *In addition to her Heritage support, she receives funding from the Canadian Institutes of Health Research (CIHR), the National Institutes of Health (NIH) in the United States, and the Canada Foundation for Innovation (CFI).*

Selected publication

Thomas SL, Gorassini MA. Increases in corticospinal tract function by treadmill training after incomplete spinal cord injury. *Journal of Neurophysiology* 2005 Oct;94(4):2844-2855.

ABOVE: DR. MONICA GORASSINI

AT THE FORE

THE EVOLUTION OF AHFMR'S TECH

What a difference 14 years can make. AHFMR's Technology Commercialization (TC) Program was very small when the Edmonton Sun *profiled it in June 1992. The story was one of promise. The article focused on the potential of new medical devices and therapies, and highlighted a few inventions, including a computer-controlled artificial leg developed by University of Alberta professor Dr. Richard Stein.*

Fast-forward to March 2006, and an *Edmonton Journal* story on another Stein invention: the WalkAide, an electronic medical device which makes walking easier for patients who experience foot drop (the inability to lift the foot) due to stroke or spinal cord injury. The device grew out of the research profiled in 1992, and its development received support from the TC Program. But the *Journal* article has a distinctly different flavour when compared to its forerunner. It is a story of promise fulfilled: an Alberta innovator whose invention is on the market and making a significant difference in many people's quality of life.

The success doesn't surprise Dr. Bill Cochrane, the former dean of medicine and president of the University of Calgary. A successful entrepreneur, Dr. Cochrane believes passionately in the potential for commercialization of health-related research in Alberta. "AHFMR's establishment in 1980 was a visionary act that set the stage for world-class scientific achievement. Alberta-based researchers are contributing cures, therapies, evidence, and knowledge that help us all live better and healthier lives.

"Early on, AHFMR recognized that some of these discoveries could be the bases for new business ventures. In 1985, it established the Technology Commercialization Program, one of Canada's first technology-transfer programs. Helping researchers take innovations from the lab to the marketplace is an important extension of AHFMR's role in funding research, and contributes to the future economic growth of the province."

This has always been the primary objective of the TC Program: to assist Alberta innovators in taking new health-related ideas and scientific findings and developing them into technology aimed at improving health. Since its inception, the program has invested more than $24 million to support technology-commercialization activities.

While the TC Program has been expanding, its focus on people has remained constant. This emphasis

FOREFRONT PROGRAM OVERVIEW

Career development:
- Internship Program
- MBT/MBA Studentship Award (in development)

Industry development:
- Executive-in-Residence Award
- Senior Recruitment Health Industry Award (in development)
- Industrial Researcher Award (in development)

Technology development:
- Three phases of project funding
- Mentorship
- Education

ABOVE: DR. RICHARD STEIN WITH THE WALKAIDE

FRONT

NOLOGY COMMERCIALIZATION PROGRAM

has now been broadened to include support not only for innovators, but also for those people with the wide variety of skills and experience necessary to build and support successful biotech and health-related industries in Alberta.

"Technology commercialization is important for the development and application of new technologies that will both improve health care, and diversify and contribute to the economy," says Bob Miller, vice-chancellor for Research at the University of California, Santa Cruz, and a member of the international board which evaluated all of AHFMR's operations in 2004. "The critical element in technology commercialization is people—not only the innovators who come up with the ideas, but a range of other people with skills in many areas, such as intellectual property, applied research, marketing, sales, and business development.

"That's what I like about AHFMR's new direction for technology commercialization. The program is all about supporting people. AHFMR listened to recommendations and changed the program so it is in line with what's needed in Alberta."

The Foundation has also renamed its TC Program ForeFront—which reflects this more comprehensive support for people, projects, and industry. The ForeFront Program has two objectives:

- **To build industry capacity** through the support of people with the necessary skills and experience
- **To support projects at the pre-commercialization stage** ForeFront will build on its support for people by piloting new initiatives, while continuing to fund pre-commercialization projects.

"The establishment of our program was a promising addition to Alberta's innovation system," says Linda Humphreys, AHFMR's vice-president of Corporate Affairs and Commercialization. "We charted our course for supporting innovators in the province. Results to date show that by providing support for people we can help improve health, foster a vibrant health industry, create exciting career opportunities, and establish successful companies. ForeFront builds on this foundation. Our goal is to strengthen Alberta's pipeline for the transfer of medical and health research into products and processes that will ultimately improve health—not just for Albertans, but for people around the world."

Charting Progress 2006 *highlights AHFMR's past successes and future initiatives in supporting technology commercialization in Alberta. For a copy of the report, please visit our web site at www.ahfmr.ab.ca or contact Tina Blake at tina.blake@ahfmr.ab.ca.*

FOREFRONT'S NEW INITIATIVES

Executive-in-Residence Award brings in senior-level management with relevant industry experience and appropriate networks to advance the application of research and technologies to the next levels of commercialization. This project began in January 2006 and will be evaluated after the first year.

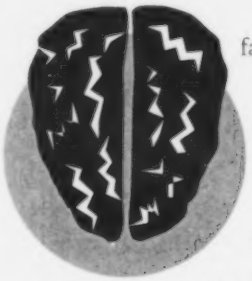
Senior Recruitment Health Industry Award (in development) brings in needed expertise in a wide variety of critical areas by supporting the salaries of new recruits at the senior technical and management levels in Alberta-based medical/health companies.

Industrial Researcher Award (in development) provides support for Alberta-based companies to recruit recent graduates with master's and doctoral degrees to conduct research that benefits the organizations.

Studentship Award (in development) supports students in the Masters in Biomedical Technology (M.B.T.) program at the University of Calgary, or the Masters in Business Administration (M.B.A.) program in Technology Commercialization at the University of Alberta.

In his family's footsteps

AHFMR Clinical Fellow Dr. John Kelly wants to find new ways to battle brain cancer. The young neurosurgeon hopes his research will ultimately help to solve some of the mystery surrounding the causes of this disease, and lead to treatments that will improve outcomes for patients with brain tumours.



"Brain cancer is such a devastating disease. It usually hits people in the prime of life, between the ages of 40 and 50, but every year you also see teenagers and children diagnosed with brain cancer. It's really sad—with the most common type and grade of brain cancer, the majority of adults are dead within a year."

There are two main types of brain tumours: primary cancers that start in the brain, and those that spread from cancer somewhere else in the body. Primary brain tumours are less frequent than secondaries but are usually malignant, meaning that they spread. The Canadian Cancer Society estimates that there will be 2,500 new cases of brain cancer, and 1,650 deaths from it, in Canada during 2006. Although people of any age can develop a brain tumour, the problem seems to be most common in children aged between 3 and 12, and in adults between 40 and 70.

Dr. Kelly is certainly on the right path to achieve his dream of helping cancer sufferers. As a child and teenager, he was inspired to become a doctor by the dedication, energy, and enthusiasm of his parents: his mother is a psychiatrist and his father a pathologist. "My parents had a huge impact on me," he says, adding, "I have a sister who became a doctor, as well; she's a radiologist."

After graduating from the University of Alberta with a medical degree in 2001, Dr. Kelly began post-graduate residency training in neurosurgery at the University of Calgary. With financial support from AHFMR, he has now put

DR. JOHN KELLY

"I started to wonder about the relationship of stem cells and brain cancer"

this surgical training on hold to complete a Ph.D. at the Hotchkiss Brain Institute in Calgary, focusing on brain cancer. Here he has another wonderful role model: his supervisor, Institute director Dr. Sam Weiss. An AHFMR Scientist, Dr. Weiss achieved international renown when he discovered that brain cells can regenerate. He also discovered the existence of spinal stem cells—a finding which may someday lead to new treatments for paralysis.

"I've been extremely fortunate to work with Sam Weiss," says Dr. Kelly. "He's such an accomplished scientist. He encourages independent thinking, lets you develop your own ideas, and supports you through that process. It's incredible working here."

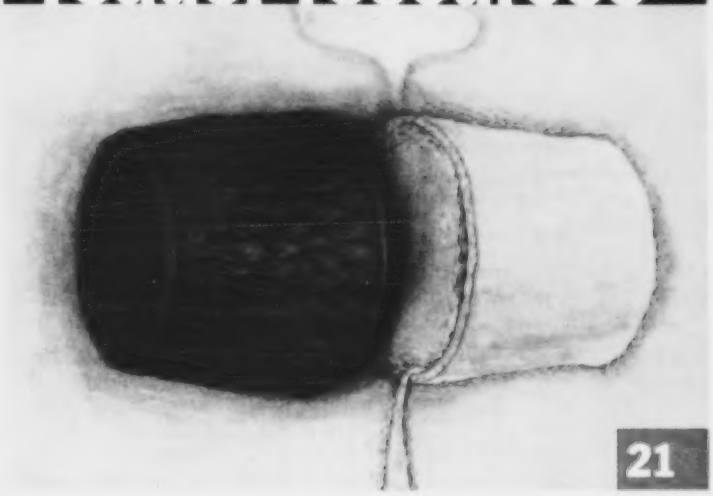
AHFMR trainee support is nothing new to Dr. Kelly. Prior to medical school, as a Heritage Summer Student, he spent time working in Dr. Roland Auer's stroke-research laboratory at the University of Calgary.

"I started out studying stem cells in stroke, and then developed an interest in neuro-oncology, the diagnosis and treatment of brain cancers," he explains. "I started to wonder about the relationship of stem cells and cancer, particularly brain cancer."

Although it is thought that stem cells normally work as a repair system in the body, their ability to replicate also suggests a link with several cancers. The relationship between stem cells and brain cancer, however, is an extremely new area of research.

"We're trying to establish an understanding of the true cellular origin of brain tumours: fundamentally, which cells initially give rise to them," explains Dr. Kelly.

Dr. John Kelly is an AHFMR Clinical Fellow in the Department of Clinical Neurosciences and a Ph.D. candidate at the University of Calgary's Hotchkiss Brain Institute.



Fatigue and illness

Canadian Liver Foundation
http://www.liver.ca/Home.aspx

American Liver Foundation
http://www.liverfoundation.org/

Adolescent nutrition and lifestyle

Dr. Linda McCargar presentation on nutrition and physical activity behaviour in Alberta youth
http://www.chps.ualberta.ca/research/online_presentations/symposium_2004_mccargar.pdf

Basic research: the foundation for medicine

Dr. Susan Lees-Miller's web site
http://www.ucalgary.ca/~leesmill/

Dr. Paul Melançon's web site
http://www.ualberta.ca/CELLBIOLOGY/melancon.html

Dr. Tracy Raivio's web site
http://www.biology.ualberta.ca/faculty/tracy_raivio/

Dr. Chris Bleackley's web site
http://www.biochem.ualberta.ca/faculty_detail.php?id=2

The mechanics of osteoporosis

Dr. Steven Boyd's web site
http://www.enme.ucalgary.ca/~skboyd/

Osteoporosis Canada
http://www.osteoporosis.ca

Micro-CT Systems
http://www.scanco.ch

Learning to walk...again

International Collaboration for Repair Discoveries
http://www.icord.org

The Christopher Reeve Foundation
http://www.christopherreeve.org

At the ForeFront

AHFMR ForeFront Program
http://www.ahfmr.ab.ca/tc/

Researchers in the making

Hotchkiss Brain Institute
http://www.hbi.ucalgary.ca/

Heritage Youth Researcher Summer (HYRS) Program 2006

Sean Heisler has been thinking a lot about university. The Calgary high-school student will enter Grade 12 in the fall, and he isn't quite sure what he wants to study after that. Maybe sciences. Maybe biomedical engineering. Maybe medicine.

"Since I can't even watch *ER* on television, I really don't think treating patients is for me. But I am attracted to the laboratory side of medicine."

Sean is getting the opportunity to test this out. In July, he began work in the lab of Heritage Scholar Dr. Richard Wilson at the University of Calgary. This work experience is offered by the Heritage Youth Researcher Summer (HYRS) program, AHFMR's hands-on summer research program for Grade 11 students.

"I've done summer camps at the University of Calgary which involved laboratory work, but nothing so advanced," says Sean. "This is a great chance to see what a research career is like."

Dr. Wilson, a physiology professor, studies the basic mechanisms involved in the control of breathing. He supervised a student in the 2005 HYRS program and enjoys the intellectual stimulation of being surrounded by bright, enthusiastic high-school students.

"The HYRS program enables young students to immerse themselves in a new field at a very advanced level. As they face the intellectual challenge involved, they sometimes look at problems in ways veteran researchers may not have considered, providing a gold mine of new ideas. Researchers often learn as much from the questions they are asked by bright students as the students learn from the replies they are given!"

Sean is one of 45 high-school students participating in the 2006 HYRS program; 171 students, representing 81 schools throughout the province, applied to the program. To qualify for HYRS, students must achieve an 85% average in the required math and science subjects; they must also obtain two teacher references and one community reference, and write an essay on an assigned topic. Applications are judged by a committee of high-school science teachers.

ABOVE: SEAN HEISLER AND DR. RICHARD WILSON

Dear Reader,

If you are not already on our mailing list for our quarterly AHFMR Research News, and would like to receive it, please phone, fax, e-mail or write us and ask to be added to our subscribers list. It's free!

Phone: (780) 423-5727 and ask for AHFMR Communications

Fax: (780) 429-3509

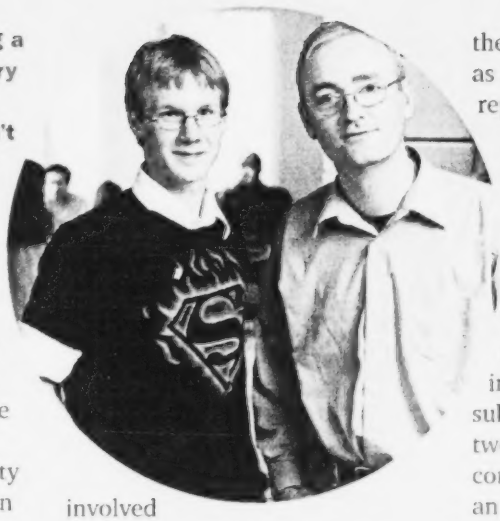
E-mail: ahfmrinfo@ahfmr.ab.ca

Write:
Alberta Heritage Foundation for Medical Research
1500, 10104 – 103 Avenue
Edmonton, Alberta T5J 4A7

Canadian Publications Agreement #40064910
Return undeliverable Canadian addresses to:
AHFMR 1500, 10104-103 Avenue Edmonton, AB T5J 4A7

Physicians: please place in your patient waiting rooms.

Sean Heisler has been thinking a lot about university. The Calgary high-school student will enter Grade 12 in the fall, and he isn't quite sure what he wants to study after that. Maybe sciences. Maybe biomedical engineering. Maybe medicine.



"Since I can't even watch *ER* on television, I really don't think treating patients is for me. But I am attracted to the laboratory side of medicine."

Sean is getting the opportunity to test this out. In July, he began work in the lab of Heritage Scholar Dr. Richard Wilson at the University of Calgary. This work experience is offered by the Heritage Youth Researcher Summer (HYRS) program, AHFMR's hands-on summer research program for Grade 11 students.

"I've done summer camps at the University of Calgary which involved laboratory work, but nothing so advanced," says Sean. "This is a great chance to see what a research career is like."

Dr. Wilson, a physiology professor, studies the basic mechanisms involved in the control of breathing. He supervised a student in the 2005 HYRS program and enjoys the intellectual stimulation of being surrounded by bright, enthusiastic high-school students.

"The HYRS program enables young students to immerse themselves in a new field at a very advanced level. As they face the intellectual challenge involved, they sometimes look at problems in ways veteran researchers may not have considered, providing a gold mine of new ideas. Researchers often learn as much from the questions they are asked by bright students as the students learn from the replies they are given!"

Sean is one of 45 high-school students participating in the 2006 HYRS program; 171 students, representing 81 schools throughout the province, applied to the program. To qualify for HYRS, students must achieve an 85% average in the required math and science subjects; they must also obtain two teacher references and one community reference, and write an essay on an assigned topic. Applications are judged by a committee of high-school science teachers.

ABOVE: SEAN HEISLER AND DR. RICHARD WILSON

Dear Reader,

If you are not already on our mailing list for our quarterly AHFMR Research News, and would like to receive it, please phone, fax, e-mail or write us and ask to be added to our subscribers list. It's free!

Phone: (780) 423-5727 and ask for AHFMR Communications

Fax: (780) 429-3509

E-mail: ahfmrinfo@ahfmr.ab.ca

Write:
Alberta Heritage Foundation for Medical Research
1500, 10104 – 103 Avenue
Edmonton, Alberta T5J 4A7